UPPER TRISHULI-1 HEP (216MW)			
Client	Doosan Heavy Industries & Construction		
DHI's Subcontractor	Power Construction Corporation of China		
REPLY COMMENT			
Subcontractor	Power Construction Corporation of China		
Incoming Document			
Title of the Document	**Surrounding Rock Stability Calculation of Adit No. 3**		
Document/Drawing No.	UT1-C-150-CVL-DC-43002	Revision	C
Review Document No.	**TJ/UT1/OUT-10**	Reviewed Note No.	**RN-0014**
Received Date	**30.09.2021**	Review status	**RR**
Outgoing Document			
Previous Reply No.	RC-0002	Previous Reply Date.	**20.09.2021**
Reply No.	RC-0011	Reply date	**31.01.2022**

General Comments

The report in hand is of the same structure and contains similar content as the report "Surrounding Rock

Stability Calculation of Investigation Tunnel for the Powerhouse", document No. UT1-C-385-CVL-DC-65001.

The designer is requested to incorporate the comments already made in the respective Review Note 0009,

dated 20.09.2021, which refer to the general technical approach required for such report. Furthermore, the

designer is requested to use the rock parameters, which we have listed in our Review Note regarding the

"Statement of surrounding Rock Parameters of Adit No. 3". These are:

Upper Trishuli 1 HEP; Estimation of Rock Mass Strength and Deformation Properties for Tunnel Design

Rock Class	Q-value	Unit Weight 1)	Modulus of Deformation 2)	Poisson's Ratio	Cohesion 3)	Friction Angle 3)	UCS rm 4)	Dilation Angle 5)
	[-]	[kN/m3]	[GPa]	[-]	[MPa]	[°]	[MPa]	[°]
I	>40	2,70	26,8	0,20	5,00	50	27,5	17
II	10 to 40	2,70	20,5	0,25	2,50	45	12,1	15
III	4 to 10	2,65	8,6	0,25	1,00	37	4,0	12
IV	1 to 4	2,60	2,3	0,30	0,50	30	1,7	10
V	<1	2,40	0,9	0,35	0,20	25	0,6	8

1) For determination of in-situ stresses the unit weight shall be taken as 2,65 kN/m3 for all rock classes.
2) The rock mass modulus of deformation was calculated using the equation of Hoek&Diederichs (2006) using GSI 10, 30, 50, 70 90, respectively and assuming D=0, MR = 400, σci = 70 MPa.
3) Residual strength parameters shall be reduced by 1/2 for the cohesion and 20% for the friction angle.
4) UCSrm, "uniaxial strength of rock mass" was calculated using the Mohr-Coulomb-Criterion.
5) Dilation angle was estimated as 1/3 of the friction angle.
Presented parameters do not account for individual structural defects such as foliation or local shears.

Reply: Accept. The calculation has been revised with the parameters and the comments for the investigation tunnel.

The overburden thickness shall be taken as the maximum overburden thickness expected for the whole

tunnel. In this case is the maximum overburden thickness 300 m as stated in the report. This overburden

thickness shall be used for all rock classes as all rock classes may prevail in the tunnel, particularly far away

from the portal, where the occurrence of shear zones or other weak zones cannot be excluded.

Reply: Accept. The class I~III calculating has been taking the maximum overburden and the maximum overburden with 200m is appropriate for the class IV. If encountering overburden thickness exceeds 200m and the Contractor will study it specially. As for the class V, according to the geological speculation, it may appear nearby the portal and the overburden thickness will usually not be too thick (about 50m~100m). If encountering the thick overburden of class V, the Contractor will study it specially. In the Contractor's experience, the class V strength parameter will be enhanced to class IV after applying engineering measures (such as fore-poling rock dowels, pre-grouting). So the calculation report includes surrounding rock class I~IV. If any special situation occurs, we will take immediate measures and submit the corresponding treatment plan to the OE for approval.